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CHANGES IN

The Courses of Study and the Examination Requirements

IN

CONTINUATION SCHOOLS, HIGH SCHOOLS
AND COLLEGIATE INSTITUTES

NO. 2—AUGUST, 1921



Issued by Authority of
THE MINISTER OF EDUCATION

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Changes in the Courses of Study and the Examination Requirements in Continuation Schools, High Schools and Collegiate Institutes

Since the publication of the circular in June outlining the changes in the courses of study and examination requirements in Continuation Schools, High Schools, and Collegiate Institutes, a Committee has been engaged in revising the details of the courses of study in the subjects of Science and Mathematics. This Committee has now completed its work and has submitted its Report to the Minister of Education. The Minister approves of these details, and takes this opportunity of announcing them to Principals and others concerned.

At the same time he wishes to announce certain modifications in the scheme of examinations (particularly in the Lower School) to which he has given his approval with the object of removing as much as possible of the pressure and inconvenience that are inevitable during the period when the old system is being carried along side by side with the new.

EXAMINATIONS IN LOWER SCHOOL SUBJECTS.

Beginning with 1922 there will be no examination in Reading and Writing, and no special paper in Spelling. Papers will be set in the subjects of Canadian History and Civics, Geography, Art, Botany, Physiography, Arithmetic, Grammar, and Zoology. For those candidates who elect to take Agriculture and Horticulture in lieu of Botany and Zoology, there will be a first and a second year paper in Agriculture and Horticulture. In addition, there will be a paper in Latin Grammar for those who wish to substitute Latin Grammar for English Grammar.

In all subjects the standard for passing will be 50 per cent on each paper.

In consideration of the fact that the subjects of Geography and Canadian History and Civics are usually completed in the First year of the High School course, the Minister has approved of a recommendation that for the examination of 1922 only, but not for a subsequent examination, pupils enrolled in the second year classes of the Lower School in the academic year 1921-22, shall be excused from an examination in these two subjects on presenting a certificate from their Principal that they have successfully completed the courses in these two subjects, and have been duly promoted thereon.

EXAMINATIONS IN THE MIDDLE AND UPPER SCHOOL SUBJECTS.

The subjects upon which papers will be set for the Middle and the Upper School examinations are enumerated on pages 8 and 9 of the circular issued last June. For the present there are no changes in the content of the subjects of these courses other than are indicated in this circular.

THE COMMERCIAL COURSE.

The Commercial Course has not yet been revised. It is expected that Principals will continue their Commercial Departments under the former organization.

GENERAL.

Where the course in Middle School English is completed in the first year of the Middle School, the Upper School course in English should be added to the second year of the Middle School course.

In arriving at the number of subjects to be taken by any pupil, Physical Culture, Manual Training and Household Science shall not be counted.

In conclusion, the Minister hopes that Principals and teachers will endeavor to give the new course a fair trial. It will be surprising if minor amendments are not needed to bring it to perfection. But he believes that in its main outlines it will be found to accomplish what is expected of it, namely, to relieve the overpressure which has long been the subject of complaint, and at the same time to enable the pupil to obtain a more thorough mastery of the subjects of study.

COURSES OF STUDY FOR 1921-22.

The following are the courses of study in Physiography, Lower School Botany and Zoology, Lower and Middle School Agriculture and Horticulture, and Mathematics.

PHYSIOGRAPHY.

The course in Physiography is intended to be, as far as possible, an experimental and practical one carried on in the science laboratory and in the field by teachers who are skilled in laboratory practice. The only text-books available at present are the Ontario High School Physical Geography and the Ontario High

School Physics, but while most of the headings are taken from the titles of chapters or sections in these books (in which cases the contents of the chapters or sections may be regarded as the prescription of work), it is obvious that they will have to be supplemented by students' note-books containing records of experiments and observations, drawing of apparatus, etc.

Under no conditions should an attempt be made to subdivide the subject of Physiography into Physical Geography and Physics, taught by different members of the staff. To do so would be to defeat one of the main objects of the course.

DETAILS OF THE COURSE.

Physiography: Meaning of the term, how related to other subjects.

Measurements: Measurements in metrical units of length, area, volume and mass; comparison of metrical and British units; the balance; practice in weighing; the three states of matter; the thermometer; Fahrenheit and Centigrade scales.

The Earth's Surface:

Rocks: Examinations of hand specimens of granite, sandstone, limestone, shale, gneiss, conglomerate.

How rocks are formed.

Classification of rocks.

The effects of changes in temperature on rocks; experiments to show the expansion and contraction of liquids and solids by changes in temperature; the abnormal expansion of water on freezing.

Air: Experiments,—Constituents of air; combustion in air, and the resulting changes; rusting of a metal such as iron in the air and how it effects the air; detection of carbon dioxide and water vapour in air.

Water: The work of ground water and of running water.

Simple experiments to illustrate the removal of suspended matter by filtration; the solvent power of water; the removal of dissolved matter by distillation; the solvent power of water containing carbon dioxide; the absorption of water by some kinds of rock.

Wind-work and weathering.

Other disintegrating agencies.

The work of plant and animal life in the formation of soil.

The work of waves and of ice masses.

A detailed study of the following—rivers, valleys, lakes, glaciers, underground waters, caverns, springs, mineral veins.

To accompany this—statement and experimental verification of Pascal's Law, some of its most important applications; pressure of liquids in its relation to direction, depth, density of liquid, area pressed, and the shape of containing vessel; Archimedes' Principle; flotation; determination of the specific gravity of a solid such as quartz or granite and of a solid such as wood or ice, and of the specific gravity of a liquid by the specific gravity bottle and by the hydrometer.

Plains, mountains and plateaus.

Volcanoes and earthquakes: Simple experiments to show that heat is produced by friction, by percussion, by compression, by combustion; simple experiments to illustrate the expansion of gases by changes in temperature; freezing and boiling points of water in relation to pressure.

Atmosphere: Experimental study of the properties of a gas exhibited in air as a type; proof that air has weight, occupies space, and exerts pressure; construction of the barometer; the relation between the volume and the pressure of a gas; practical application of air pressure; common pump, siphon.

Water vapour in the air; clouds and fog, dew and frost, precipitation, winds, storms, weather, climate; temperature of the atmosphere; maximum and minimum thermometers.

Experiments on the transmission of heat by conduction, convection and radiation.

Experiments on evaporation and boiling; the boiling and freezing points of water; relation of the boiling point of water to pressure; simple experiments to illustrate the heat of fusion of ice, and the heat of vaporization of water; simple experiments to show the high specific heat of water; experiment to show that the freezing point of salt water solutions is lower than the freezing point of pure water.

The Sky: Simple experiments on reflection, refraction and dispersion of light with special reference to atmospheric phenomena, e.g., color of the sky, halos, rainbows.

The Ocean: Sea-water, sea-floor, ocean basins, waves, currents, tides, temperature of the ocean, changes in the shore line, deep sea sounding, islands and ocean life.

Simple experiments to illustrate centrifugal force; relation of centrifugal force to tidal movements.

The Earth's Magnetism: Simple experiments on magnets; simple experiments to illustrate magnetic attraction and repulsion and the phenomena of magnetic induction; neutralization of poles; magnetism induced by the earth; magnetic and geographical poles of the earth; the mariner's compass; declination and inclination.

The Solar System: Simple experiments to show that light travels in straight lines; shadows, umbra and penumbra.

Motions of the sun, moon and earth; eclipses of the sun and the moon; day and night; seasons; moon's phases; latitude; longitude; standard time, solar time, sidereal time.

Life on the Earth:

Geological History of Canada.

LOWER SCHOOL BOTANY

The course in Botany as outlined below is based on the authorized text-book—Bailey's Beginner's Botany. This book is intended to be used not only as a text-book but also as a book of reference, as it contains matter for general reading which is beyond the limits of the course.

The course in Botany is to be essentially practical and experimental, and it is expected that the pupils will continue to use note-books for drawings and for records of experiments and observations.

The teacher's immediate responsibility lies in the laboratory work, but this should be supplemented by outdoor work which will of necessity vary with the locality. The teacher should encourage and direct the pupils, devoting a fair portion of the time of the class to discussions and reports on their independent work. Arrangements should be made for field excursions on suitable occasions.

The division of the course into three seasonal groups is intended merely as a suggestion to the teacher and not as a fixed arrangement.

FALL TERM

The plant as a whole: A study of common plants such as buttercup, phlox, petunia, mallow, mustard, sweet alyssum, bouncing bet—at least four should be studied in detail, taking up the structures of all the parts in succession; the study of additional plants to illustrate the various forms of roots, the structure, arrangement, margin and form of foliage leaves, the relation of leaves to sunlight and air, the varieties of stems as underground, erect, prostrate, climbing, twining, etc.; the common types of inflorescence.

Study of typical composites e.g., dandelion, sunflower, chicory, etc.

The identification, by the use of a botany key, of a few common plants.

Fruits: Meaning of the term; structure and classification of the fruits of such plants as bean, shepherd's purse, milkweed, poppy, apple, sunflower, tomato, grape, plum, cucumber, corn and maple; adaptations for the dispersal of seeds and fruits.

Fungi: Recognition and mode of life of the following saprophytes—mushroom, puff-ball, polypore; recognition, economic importance and control of the following parasitic fungi;—grain rust, (*Puccinia graminis*) loose smut of oats (or corn smut), apple scab and black knot.

Preparation for Winter: Storage of reserve food in root, stem, leaf and seed; study of winter buds, their arrangement, structure and means of protection; the fall of the leaf; interpretation of leaf and scale scars on trees and shrubs.

WINTER TERM

Seeds and seed germination: The study of germinating seeds of bean or squash, corn or wheat, acorn or horse chestnut, pine or spruce, observing the markings and parts of these seeds, and the changes in the parts during ger-

mination; discussions of the functions of the parts of the seed and of the most suitable conditions for the germination of seeds.

Plant structures: Structure of the stems of herbaceous dicotyledons and monocotyledons studied by the aid of a hand lens; study of a stomate and a plant cell from a thin preparation of the surface of such leaf as fern, tradescantia or lily, under the low power of a compound microscope; observation of lenticels; study of a young root showing root-hairs and mode of branching.

Experiments: Simple experiments illustrating osmosis, the application of this force in explaining absorption by plant roots; simple experiments illustrating capillarity, the application of this force in explaining movements of water in soil; experiments to show the presence of soluble and insoluble materials in soils; experiments to illustrate leaf-functions, e.g., transpiration, manufacture of starch in sunlight, disappearance of starch in darkness, exhalation of a gas by green plants, demonstration of the presence of chlorophyll. Simple experiments to illustrate stem-functions, e.g., conduction of cell-sap, heliotropism, wilting of plants, rooting of cuttings of house plants, testing for starch in tubers, seeds, etc.; simple experiments to illustrate region of growth of young roots.

Ferns: General structure and habits of a common fern.

Wood Sections: Study of cross sections of a common tree, such as an elm or a cherry, noting pith, annual rings, heart-wood, sap-wood, cambium, bark, medullary rays.

Supplementary Studies: The reading of articles on such economic problems as the following:—improvements of varieties of plants, competition in plant colonies, why weeds are hard to eradicate, uses of plants for food, clothing, building, medicine, paper, etc. Class discussion of the above problems.

SPRING TERM.

Forestation: How to plant a tree; principles of tree pruning; propagation of trees by seeds, budding, grafting, cutting, and coppice growth; importance of reforestation.

Plant Identification: Identification of plants continued. Sufficient practice should be given in the use of the key to enable the pupils to identify the common flowering plants of the locality.

Spring Plants: Relation of flower structure to mode of pollination; meaning and value of cross-pollination; spines, prickles, tendrils, underground parts, their forms and uses.

LOWER SCHOOL ZOOLOGY

The General scope of the work in Zoology is as follows:—

Indoor Study of Living Animals: The teacher's immediate responsibility lies in the laboratory work which embodies simple morphological studies of common forms, representing the chief animal types. These studies must, wherever possible, be supplemented or preceded by observation on living specimens. For this purpose, provision will be needed for suitable aquaria and vivaria, where the moving, breathing, and feeding of the living animals may be within ready view of the pupils. *These morphological studies are not to end in the study of form, but accompanying the observation of the form there must be a constant effort to interpret the meaning of the form, to show the relation of form and function.*

Outdoor work; which will of necessity vary with the locality, must be carried on to a very large extent without the teacher's direct supervision. But the teacher should encourage and direct the pupils, devoting a fair portion of the time of the class to discussions and reports on their independent work. Arrangements should be made for field excursions on-suitable occasions.

School Museum: For progress in the natural history side of the subject, the equipment detailed on pp. 63-65 of H. S. Regulations, 1914, should be provided. The school museum should be a thing of gradual growth, and great care should be taken in the selection of the material.

Supplementary Reading: For general reading and discussion the following additional topics are suggested: —the humane treatment of domestic animals; the conservation of wild

animal life; destructive mammals; relation between plants and insects; interdependence of the plant and animal kingdoms; farming of fur-bearing animals.

DETAILS OF THE COURSE

The course in Zoology as outlined below is based on Coleman's *Beginners' Zoology*, which is to be used as a textbook by the pupils and also as a book of reference, as it contains matter beyond the limits of the course.

Arthropods:

1. Insects (a) Study of the main external features and of the life-history of a grasshopper.
- (b) Comparison of a grasshopper with a spider and a centipede or a millipede, as to main external features.
- (c) Description, life history, relation to man, and methods of combating four harmful insects:—Colorado potato beetle, codling moth (or cabbage butterfly), mosquito, house fly (or bot fly).
- (d) Description, life history and relation to man of the following beneficial insects:—honey bee, dragon fly, silkworm.
- (e) Recognition-characters of the principal orders of insects.
- (f) Brief discussion of the principal insect pests of the locality.
2. Crustaceans:—crayfish, external features with special reference to the organs and modes of breathing, walking, swimming and securing food.

Earthworms: External features, food, habits, economic importance.

Molluscs:

1. Clams: Shell, composition and internal and external markings, gills, foot and syphons, observation of live specimens.
2. Slugs or Snails: External features, observation of live specimens.

Fishes: External features, gills and mode of breathing, feeding habits. Economic importance of fish, chief food-fish of Canada, fish-hatcheries, laws protecting fish.

Amphibians:

Frogs: Life history, external features, economic importance of toads and frogs.

Reptiles:

Turtles and snakes: Chief external features, discussion of the habits and economic importance of snakes.

Birds: External features; study of feathers, adaptations for flight, including those of the skeleton; importance of birds; protection of birds; migration of birds; recognition of twenty common birds, including some winter birds (i.e. how to know them when they are seen); comparison of the bills and feet of different types of the birds of Ontario as related to their life habits.

Mammals: External features of a cat or a rabbit; skeleton of cat or rabbit; teeth of the following mammals as related to their life habits (a general idea of position and form),—cat, rabbit, bat, horse, cow; feet of the following mammals in relation to their life habits;—cat, dog, bat, mole, beaver (or muskrat), horse; uses of mammals to man from pupil's experience and reading, (food, clothing, work, etc.); recognition of the common wild mammals of the locality and discussion of their habits.

AGRICULTURE

LOWER SCHOOL—FIRST YEAR

Bacteria: What they are and where they occur.

Relation to .

Foods: Experiments to show pasteurization and sterilization of milk and of canned foods.

Water pollution: Spread of such infectious diseases as typhoid fever;; purification of water by boiling; use of chloride of lime as a disinfecting agent.

Infectious diseases; such as tuberculosis, typhoid fever, diphtheria.

Discussion of the agents of infection such as house-flies, drinking cups etc.

Gardening: Work in home gardens arranged; plans for home gardens; preparation, care and uses of hot bed and cold frame; preparation of soil; methods of growing early vegetables such as potatoes, onions, rhubarb, lettuce, cabbage, tomatoes; methods of growing strawberries, currants; selection of varieties of plants; planting

tables; care of growing plants; preparation and planting of experimental and demonstration plots in school garden.

Botany: Parts of a plant such as root, stem, leaf, flower, flower-cluster; field study of weeds; recognition of fifteen common weeds; habits of growth, methods of seed distribution and principles of weed eradication; study of typical composites, e.g., dandelion, sunflower, chicory, etc.; collection of weed seeds.

The study of

- (a) Roots—e.g., corn, grass, sweet clover, carrot.
- (b) Stems—e.g., sunflower, mallow, ivy, bindweed, couch grass.
- (c) Foliage—e.g., corn, beet, bean, horse-chesnut.
- (d) Common types of inflorescence—e.g., mustard, plantain, carrot, clover, dandelion.

Arrangement of leaves with respect to light; functions of leaves; absorption of solutions by roots; movement of liquids through plants.

Seeds and seed germination: The study of germinating seeds of bean or squash, corn or wheat, acorn or horse-chestnut, pine or spruce, observing the markings and parts of these seeds, and the changes in the parts during germination; discussion of the functions of the parts of the seed and of the most suitable conditions for germination of seeds.

Entomology: External structure of grasshopper, butterfly and beetle; characteristics by which insects are distinguished from other closely related invertebrates and these again from one another, based on the study of a grasshopper, a spider, a millipede (or a centipede); manner in which insects breathe; structure of mouth parts, using for examination a grasshopper and a housefly or blow-fly; rearing common insects from egg to adult or from larva to adult and egg, with observations on their feeding habits, moulting, metamorphosis (complete or incomplete), rate of reproduction among insects; a study of common beneficial insects and the ways in which they are beneficial.

Dairying: Milk testing with Babcock tester; use of lactometer; care of dairy herds; construction of dairy stables; food value of milk, whey and buttermilk; visit to the dairy farms noting stabling and dairy practice.

Poultry: Types and breeds; incubation, brooding and rearing of chicks; management of poultry in summer; crate fattening; visits to a poultry plant; models of poultry houses.

Bee-keeping: Life history and work of bees; colony studies to learn organization; swarming; construction of hives and methods of handling; management of bees in Fall and Winter.

Home Projects: Completion of one home project which may be selected from such topics as:—

1. Management of a colony of bees.
2. Making a collection of insects.
3. Making a collection of weeds.
4. Use of Babcock test on a herd during the summer.
5. Management of home plot or garden.
6. Growing and canning fruit.
7. Growing and canning vegetables.
8. Construction and care of a hot-bed.
9. Incubating and raising a brood of chickens.
10. Baking bread for exhibit at school fair.
11. The production of mangel, turnip or cabbage seed.
12. The testing of two varieties of a vegetable.
13. The testing of the value of a commercial fertilizer.

AGRICULTURE

LOWER SCHOOL—SECOND YEAR

Botany: Study of grasses with special reference to their economic importance; methods of collecting, mounting and labeling plants; study of ten noxious weeds of the locality including those mentioned in the Seed Control Act.

Fungi: Recognition, life history and saprophytic habits of mushroom, puff-ball, polypore; recognition, economic importance and control of the following parasitic fungi—grain rust (*Puccinia graminis*), loose smut of oats (or corn smut, apple scab and black knot.

Fruit-growing: Structure and classification of fruits, such as the apple, peach, strawberry; law relating to the grading of apples; grafting and budding of fruit trees; propagation of currants or gooseberries by cuttings; orchard practices and their purposes; pruning, cultivating, fertilizing and spraying; fruit packages and methods of packing.

Trees: Mode of branching; identification by means of leaves buds and bark of the following trees:—maple, ash, oak, beech, bass-wood, elm, spruce, pine and cedar.

Gardening: Selection, purchase and outdoor planting of bulbs; methods of potting and of forcing bulbs for winter bloom.

Chemistry: Experiments to show;—chemical changes; the composition of water and of air; the nature of combustion; experiments to distinguish elements, compounds, mixtures and solutions, and to show the characteristic properties of acids, bases and salts; simple experiments to prove that plants contain moisture, carbon and ash; identification of two of the products of combustion of each of the following:—wood, paper, alcohol, coal oil, and of two products of respiration; a simple study of plant substances,—testing for starch, protein, carbon dioxide; an experimental study of baking soda, baking powder and yeast, showing their properties and uses.

Soil: Collection by the students of at least four of the commonest kinds of soil found in the neighborhood, a comparison of these with respect to color, weight, size of particles, stickiness when wet, conditions upon drying, “feel” when dry, capacity for holding water, rapidity of percolation, degree of capillary action; importance of humus; importance of nodules on the roots of certain leguminous plants.

Entomology:

Study of injurious insects:—Losses from insects; natural control factors; value of fall ploughing and a short rotation of crops in the control of insect pests; insecticides for (a) biting insects, (b) piercing and sucking insects; life histories and methods of control of the housefly, cut-

worms and any other two destructive insects; recognition of the orders Orthoptera, Coleoptera, Odonata, Diptera, Lepidoptera, Hemiptera and Hymenoptera; methods of collecting, preserving and mounting insects.

Poultry: Care of eggs; candling eggs; egg preservatives; Canadian egg laws; egg circles.

Farm Animals: Types and breeds of cows, horses, sheep and swine; visits to stock farms.

Study of meats: Relative values of cuts of meat.

AGRICULTURE

MIDDLE SCHOOL

PART I—(FIRST YEAR)

AGRICULTURAL PHYSICS

Soil: Classification and identification of samples of soil by the "beaker" method into clay, loam, clay loam, sandy loam and sand; comparison of two soils by the aid of a compound microscope; identification and study of soil in the fields; experiments to show the physical effects of lime on heavy and on light soil; influence of air, cultivation and drainage on the action of lime.

Tillage: Uses of plow, cultivator, scuffler, harrow and roller; experiments to show the use of mulches, and the action of frost on heavy soil.

Drainage: Methods and value; calculation of cost of tile drainage of a given area.

Surveying: Use of instruments (including level and chain) for taking levels, running lines; calculation of areas.

Farm Mechanics: Care of tools and farm implements; experiments to show warping and splitting of wood on exposure to the weather; practice in sharpening such tools as chisel, knife and scissors; the use of levers and pulleys in machinery; principle of the internal-combustion engine.

Electricity: Electricity at rest:—Two kinds of electrification; conductors and nonconductors; gold leaf electroscope; induced electrification; electricity at points and surfaces; the Leyden jar; lightning-rods.

Current Electricity—Principle of voltaic cells; use of dry cells; galvanometer; detection of the current; simple notions of electro-motive force, current strength

and resistance including names of units; electro-magnet; relation between the direction of the current and the polarity of a magnet; telegraph; electric bell; heating devices—irons, stoves, welders, lamps; production of induced currents; laws of induced currents; the induction coil and transformer.

AGRICULTURAL CHEMISTRY ..

General: A brief study of the following elements, carbon, oxygen, hydrogen, nitrogen, phosphorus, sulphur, potassium, calcium, and the compounds of these elements used by green plants; experiments to show how these compounds are made available for plant use (e.g., the action of carbon dioxide and water on calcium carbonate); chemical symbols, formulae and equations; chemical nomenclature.

Barnyard Manure and Fertilizers: Care and treatment of barnyard manure; experiments to show the presence of compounds containing, respectively, nitrogen, phosphorus and potassium in manure; a discussion of the special influence of each of these three elements on plant growth; the value of humus and lime to the soil; commercial sources of nitrogen, phosphorus and potassium used to supplement barnyard manure; test of the relative solubility of commercial fertilizers; experiments to show why certain fertilizers should not be mixed; calculation of the percentage of available plant food in different mixtures of fertilizers; explanation of the commercial terms, "phosphoric acid" and "potash." The chief provision of the Fertilizer Act.

Insecticides and Fungicides: A study of the composition, comparative merits and methods of application of arsenate of lead, arsenate of lime and Paris green; lime sulphur, Bordeaux mixture and orchard "dusts;" use of insecticides and fungicides in combination.

Garden or Plot Work: Work in the school gardens and plots in May and June.

OR

Soil Survey: Team work in making a plan, to scale, of four square miles showing farms, roads, bridges, streams, (including natural drains) and soil (locating gravel, sand, clay, muck, depending on the locality).

AGRICULTURE
MIDDLE SCHOOL
PART II—(SECOND YEAR)

Botany: Calculation of the percentage of fowl seed in three or four samples of clover (or alfalfa) and timothy; use of compound microscope in examining spores and mycelia; recognition, from specimens, of rusts, smuts, white rust of crucifers, brown rot of stone fruits, mildew of cherry or lilac and anthracnose of bean. Chief provision of Seed Control Act and Noxious Weeds Act.

Entomology: Identification, nature of injury, life history and methods of control of any six of the most common harmful insects of the district, e.g.,—white grub, wire worm, plum curculio, codling moth, San José scale oyster shell scale, cabbage maggot, cabbage worm, Hessian fly, European corn borer, potato beetle, and clothes moth.

Poultry: Practical operation of the incubator—ventilation, moisture, candling eggs, variation in size of air chamber, blood clots, development of the embryo by examining eggs broken open every one or two days during the period of incubation; use of water-glass in preserving eggs; poultry products and marketing.

Dairying: Principles and uses of the Babcock machine and the lactometer; testing cream and skim milk (or whey) for fat; determining whether milk has been watered by use of the formula— $(\text{L.R. at } 60^{\circ} \text{ plus \% of fat}) \div 4 = \% \text{ S.N.F.}$; food value of milk and its products; principle and use of the milk separator; making butter with a laboratory churn; use of starters.

Field Crops: Different types of farming; crop distribution over Ontario; meaning and importance of crop rotation; influence of the keeping of live stock on the kind of rotation; germination tests of seed e.g., oats, turnips, corn, tion; meaning and merits of pasture crops, silage crops and soiling crops; the yield and quality of crop as influenced by the time of sowing; calculation of the relative value of certain crops as "money" crops.

Animal Husbandry: History and characteristics of the chief breeds of horses, cattle, sheep, swine; value and importance of live stock; a survey of the breeds found in the locality; meaning of pedigree stock and grade stock; disadvantage of keeping scrub stock; visit to a local farm to study the stock kept there.

OR

Horticulture: Orchard management—spraying, pruning, grafting, cultivating; cover crops; packing and marketing apples; methods of producing early vegetables; practice in seeding, transplanting, cultivating, mulching; fruit survey for at least two kinds of fruit.

MATHEMATICS

LOWER SCHOOL

Arithmetic: Review of principles; measures and multiples; fractions, (vulgar and decimal); compound quantities, including the metric system; problems on ratio, time, motion, work, etc; square root; applications of percentage; commission, insurance, duties, taxes, interest, discount, stocks and exchange; the uses of common business forms.

Oral Arithmetic.

Mensuration:—the rectangle, triangle, circle, parallelopiped, prism, cylinder, pyramid, cone and sphere.

Notes:

- (1) It is suggested that this Course should be taken in the second year of the High School Course rather than in the first.
- (2) The processes and problems in the commercial work should be such as find direct application in ordinary life. Accuracy, rapidity, and correctness of work should be kept in view.
- (3) The common business forms to be taken up are as follows: receipts, promissory notes, drafts, orders, deposit slips, cheques, bills of goods, invoices, accounts; endorsement and acceptance and consequent liability.

Algebra: Elementary work; factoring; H.C.F. and L.C.M.; fractions, simple equations of one, two and three unknowns.

Geometry: Definitions; fundamental geometric conceptions and principles; use of simple instruments, compasses, protractor, graded rule, set square; measurement of lines and angles, and construction of lines and angles of given numerical magnitude; accurate construction of figures.

Some leading propositions in plane geometry, reached by induction as a result of accurate construction of figures; deduction also employed as principles are reached and assured.

A course embracing a selection of the leading propositions, in Elementary Synthetic Geometry—(*For the Topics of this Course see Appendix "C" of H.S. Regulations, 1914*).

Exercises and deductions on the propositions of the syllabus, the constructions in practical geometry being such as would naturally spring from the Course prescribed.

MIDDLE SCHOOL

Algebra: Lower School course reviewed and continued; extraction of roots; more advanced factoring; simple graphs; simple ratio and proportion; indices and surds; quadratics of one and two unknowns; theory of quadratics.

Geometry: For details of the course see page 36 and Appendix "C" of the High School Regulations of 1914.

UPPER SCHOOL

The syllabus of Upper school work is found on page 39 and Appendix "C" of the H.S. Regulations of 1914.

